UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

August 28, 2006

R. T. Ridenoure, Vice President
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, NE 68023-0550

SUBJECT: INSPECTION REPORT 050-00285/06-017; 072-00054/06-003

Dear Mr. Ridenoure:

An NRC inspection was conducted at your Fort Calhoun Station on July 23-29, 2006. The purpose of the inspection was to verify your first dry fuel storage loading campaign was performed safely and within the requirements of the Transnuclear Certificate of Compliance and the Fort Calhoun Exemption for Dry Fuel Storage Activities granted by the NRC.

The enclosed inspection report presents the results of the inspection, which were discussed with members of your staff during the exit meeting held on July 29, 2006. The inspection found that your first dry fuel storage loading campaign was conducted in accordance with the requirements of the Transnuclear Certificate of Compliance, the Fort Calhoun Exemption for Dry Fuel Storage Activities, and NRC regulations. No violations were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Should you have any questions concerning this inspection, please contact the undersigned at (817) 860-8191 or Mr. Scott Atwater at (817) 860-8286.

Sincerely,

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle and Decommissioning Branch

Docket Nos.: 50-285
72-054
License No.: DPR-40

Enclosure:
NRC Inspection Report
050-00285/06-017; 072-00054/06-003

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SUNSI Review Completed: SPA ADAMS: ■ Yes ☐ No Initials: SPA
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DOCUMENT NAME: s:\dnms\!fcdb\spa\FC0603.wpd: R:\Reactors\FCS\

RIV:DNMS:FCDB	RIV:DRP	RIV:DRP	C:FCDB
SP Atwater	LM Willoughby	JD Hanna	DB Spitzberg
S. Atwater	E	E	DBS
08/28/06	08/23/06	08/17/06	08/28/06

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	050-00285; 072-00054
License:	DPR-40
Report No:	050-00285/06-017; 072-00054/06-003
Licensee:	Omaha Public Power District
Facility:	Fort Calhoun Station
Location:	P.O. Box 550 Fort Calhoun, NE 68023-0550
Dates:	July 23-29, 2006
Inspectors:	S. P Atwater, Health Physicist, Region IV/DNMS J. D. Hanna, Senior Resident Inspector, Fort Calhoun Station L. M. Willoughby, Resident Inspector, Fort Calhoun Station
Approved By:	D.B. Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachments:	1. Supplemental Information 2. Technical Specification Compliance Matrix 3. Inspector Notes

EXECUTIVE SUMMARY

Fort Calhoun Station
NRC Inspection Report 050-00285/06-017; 072-00054/06-003

Inspections conducted by the Nuclear Regulatory Commission (NRC) of the Fort Calhoun Station dry fuel storage project over the past 7 months provided a comprehensive evaluation of the licensee's compliance with the requirements contained in the Transnuclear Certificate of Compliance, Final Safety Analysis Report (FSAR), NRC Safety Evaluation Report (SER), Fort Calhoun Exemption for Dry Fuel Storage Activities, and 10 CFR Part 72.

The licensee met the requirements for loading and operating an Independent Spent Fuel Storage Facility (ISFSI) by integrating the ISFSI programmatic requirements into the Fort Calhoun Station 10 CFR Part 50 programs, incorporating the technical specifications into the ISFSI operating and maintenance procedures and by conducting extensive pre-operational testing of the ISFSI equipment and systems. A summary of the Technical Specifications contained in the Transnuclear Certificate of Compliance and the NRC inspection report documenting licensee compliance with them is provided in Attachment 2 to this report.

On July 23-29, 2006, the NRC observed Fort Calhoun's first loading of spent fuel into dry storage. Risk significant activities such as fuel movement, remote handling of heavy loads, and initial radiation surveys were observed. The following provides a summary of the inspection results: (Details of the inspection are provided in Attachment 3 to this report.)

- The licensee selected spent fuel assemblies meeting the criteria of the Fort Calhoun Exemption for Dry Fuel Storage Activities. The identity of each spent fuel assembly was confirmed prior to insertion into the canister. Each fuel assembly was loaded under an approved loading plan and was verified to be in the correct location following loading (Attachment 3, Fuel Selection/Verification).

- The licensee completed and approved a 10 CFR 72.212 evaluation report that documented compliance with the conditions established in the Fort Calhoun Exemption for Dry Fuel Storage Activities (Attachment 3, General License).

- The licensee verified the minimum boron concentration had been established in the spent fuel pool prior to fuel loading, as required by Technical Specifications (Attachment 3, Loading Operations).

- The licensee started the vacuum drying time clock when the initial 750 gallons had been pumped out of the canister, as required by the Fort Calhoun Exemption for Dry Fuel Storage Activities (Attachment 3, Loading Operations).

- The licensee had inspected and formally accepted the Horizontal Storage Modules in accordance with the Fort Calhoun Station Quality Assurance Program requirements (Attachment 3, Quality Assurance).

- The licensee performed remote handling of the transfer cask in accordance with ALARA objectives. The collective exposure resulting from remote handling of the first loaded minimally shielded transfer cask was consistent with other Region IV sites using fully shielded transfer casks and direct handling methods.

- The Horizontal Storage Module and Transfer Cask dose rates were confirmed to be within Technical Specification limits following loading (Attachment 3, Radiation Protection).

- The licensee was performing Horizontal Storage Module daily and startup thermal monitoring in accordance with Technical Specification requirements. The temperatures observed were consistent with the design calculations (Attachment 3, Storage Operations).

- The welding materials used for canister closure met the requirements of the NUHOMS Final Safety Analysis Report and the ASME code (Attachment 3, Welding).

Attachment 1

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

S. Andersen - Project Engineer
G. Cavanaugh - Supervisor, Regulatory Compliance
D. Guinn - Licensing Engineer
D. Hecksel - Quality Control Inspector
L. Hoegen - Radiation Protection Technician
F. Klauser - Operations Shift Manager
T. Maine - ALARA Coordinator
R. Paradies - Project Engineer
M. Pohl – Principal Reactor Engineer
M. Pope - Radiation Protection Technician
R. Ruhge – Supervisor, Quality Control
T. Steckleberg - Radiation Protection Technician
B. Van Sant - Manager, Nuclear Projects
J. Willett - Principal Reactor Engineer

TriVis Personnel

J. Antill - Quality Control Inspector
R. Barefoot - Fuel Loading Technician
R. Brown - Welder
J. Byrd - Welder
J. Crowson - Fuel Loading Technician
P. Dugan - Loading Supervisor
J. Feagan - Welder
D. Henley - Fuel Loading Technician
J. Kelley - Loading Superintendent
L. Wood – Loading Supervisor

Transnuclear Personnel

J. Axline - Project Manager
J. Chapman - Fuel Loading Communicator

INSPECTION PROCEDURES USED

60855 Operation of an Independent Spent Fuel Storage Installation
60855.1 Operation of an ISFSI At Operating Plants

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None.

Closed

None.

Discussed

None.

LIST OF ACRONYMS USED

ASME	American Society of Mechanical Engineers
AWS	Automated Welding System
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
FSAR	Final Safety Analysis Report
Gwd/MTU	Gigawatt Days per Metric Ton Uranium
HSM	Horizontal Storage Module
ISFSI	Independent Spent Fuel Storage Installation
kW	Kilowatt
mrem	millirem
MTU	Metric Ton Uranium
OPPD	Omaha Public Power District
QA	Quality Assurance
SER	Safety Evaluation Report
wt. %	Weight Percent

Attachment 2

Technical Specification Compliance Matrix

Technical Specification	Compliance Verified	Compliance Documented
1.1.1 Requirements for General License	Programs Inspection April 10-13, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003 (Fort Calhoun exemption requirements only)
1.1.2 Operating Procedures	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.3 Application of Part 50 Quality Assurance Program to the ISFSI	Programs Inspection April 10-13, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.4 Heavy Load Requirements	Crane Inspection March 13-15, 2006 Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.5 Training Module	Programs Inspection April 10-13, 2006 Heavy Loads Inspection May 1-5, 2006.	Inspection Report 050-00285/06-013; 072-00054/06-002

Technical Specification	Compliance Verified	Compliance Documented
1.1.6 Pre-Operational Testing		
1.1.6.1 Functional testing of the transfer cask and lift yoke	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.2 Loading the canister into the transfer cask and installing the annulus seal	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.3 Transporting the transfer cask to the ISFSI with the transfer trailer	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.4 Inserting the canister into the HSM, and retrieving it	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.5 Loading a mock-up fuel assembly into the canister	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.6 Canister sealing, vacuum drying and helium backfilling	Welding and Fluid Operations Inspection January 30 through February 2, 2006 Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-012; 072-00054/06-001 Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.6.7 Opening a canister	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002

Technical Specification	Compliance Verified	Compliance Documented
1.1.6.8 Returning the canister and transfer cask to the spent fuel pool	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.7 Special Requirements For First Systems Placed In Service	Programs Inspection April 10-13, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.8 Surveillance Requirements Applicability	Programs Inspection April 10-13, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.9 Supplemental Shielding	Programs Inspection April 10-13, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.1.10 HSM Configuration	Programs Inspection April 10-13, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.1 Fuel Specifications	Programs Inspection April 10-13, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003 (Fort Calhoun exemption requirements only)
1.2.2 Vacuum Drying Pressure	Welding and Fluid Operations Inspection January 30 through February 2, 2006	Inspection Report 050-00285/06-012; 072-00054/06-001
1.2.3a Helium Backfill Pressure	Welding and Fluid Operations Inspection January 30 through February 2, 2006	Inspection Report 050-00285/06-012; 072-00054/06-001

Technical Specification	Compliance Verified	Compliance Documented
1.2.4a Helium Leak Rate Testing of Inner Seal Weld	Welding and Fluid Operations Inspection January 30 through February 2, 2006	Inspection Report 050-00285/06-012; 072-00054/06-001
1.2.5 Dye Penetrant Testing of Closure Welds	Welding and Fluid Operations Inspection January 30 through February 2, 2006	Inspection Report 05000285/06-012; 072-00054/06-001
1.2.7a HSM Dose Rates	Heavy Loads Inspection May 1-5, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003
1.2.8 HSM Maximum Air Exit Temperature	First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-017; 072-00054/06-003
1.2.9 Transfer Cask Alignment With HSM	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.10 Transfer Cask Handling Outside The Spent Fuel Building	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.11 Transfer Cask Dose Rates	10 CFR 72.48 Inspection April 3-10, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002. Inspection Report 050-00285/06-017; 072-00054/06-003 (Fort Calhoun exemption requirements only)

Technical Specification	Compliance Verified	Compliance Documented
1.2.12 Maximum Canister Removable Surface Contamination	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.13 Transfer Cask Lifting Heights	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.14 Transfer Cask Operations at High Ambient Temperatures	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.15a Boron Concentration in the Canister Cavity Water	Heavy Loads Inspection May 1-5, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003 (Fort Calhoun exemption requirements only)
1.2.16 Transfer Cask Seismic Restraints	Heavy Loads Inspection May 1-5, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002
1.2.17a Vacuum Drying Duration Limit	10 CFR 72.48 Inspection April 3-10, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003 (Fort Calhoun exemption requirements only)
1.3.1 HSM Air Inlet and Outlet Inspection	Heavy Loads Inspection May 1-5, 2006 First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-013; 072-00054/06-002 Inspection Report 050-00285/06-017; 072-00054/06-003

Technical Specification	Compliance Verified	Compliance Documented
1.3.2 HSM Thermal Performance	First Loading Inspection July 23-29, 2006	Inspection Report 050-00285/06-017; 072-00054/06-003

Attachment 3
FORT CALHOUN FIRST LOADING
Inspector Notes

Category: Fuel Selection/Verification **Topic:** Allowable Fuel For Storage

Reference: CoC 1004, Tech Spec 1.2.1 Exemption

Requirement The Fort Calhoun Exemption for Dry Fuel Storage Activities limited fuel assembly parameters to those identified in Table 1 of the exemption request. These included: 1) a maximum total canister decay heat load of 11.0 kW: 2) a maximum individual assembly decay heat load of 0.500 kW; 3) a maximum assembly average burnup of 42.049 Gwd/MTU; 4) a maximum initial assembly enrichment of 4.500 weight percent (wt.%); and 5) a maximum initial assembly uranium content of 0.377 MTU. The exemption further required a minimum cooling time of 16.2 years for each assembly.

Finding: This requirement was implemented. The loading campaign consisted of four canisters containing 32 spent fuel assemblies each. The characteristics of the spent fuel assemblies selected for the first canister were reviewed to ensure the conditions required by the Fort Calhoun Exemption for Dry Fuel Storage Activities were met.

1) The first canister loaded contained a total decay heat value of 9.876 kW, as documented in Attachment 8.1 of Procedure RE-AD-0005.

2) The decay heat values for the fuel assemblies selected for the first canister ranged between 0.068 and 0.419 kW, as documented in Attachment 3 of Procedure RE-ST-DFS-0001.

3) The maximum assembly average burnup values for the fuel assemblies selected for the first canister ranged between 8.310 and 39.580 Gwd/MTU, as documented in Attachment 3 of Procedure RE-ST-DFS-0001.

4) The maximum initial assembly enrichment values for the fuel assemblies selected for the first canister ranged between 1.390 and 3.511 wt.%, as documented in Attachment 3 of Procedure RE-ST-DFS-0001.

5) The maximum initial assembly uranium dioxide content for the fuel assemblies selected for loading into the first canister ranged between 0.354 and 0.375 MTU, as documented in Attachment 3 of Procedure RE-ST-DFS-0001.

6) The cooling times for the fuel assemblies selected for the first canister ranged between 18.8 and 30.9 years, as documented in Attachment 3 of Procedure RE-ST-DFS-0001.

Documents Reviewed: Exemption from 10 CFR 72.48, 10 CFR 72.212 and 72.214 for Dry Fuel Storage Activities - Fort Calhoun (TAC No. L23984) dated July 19, 2006
Omaha Public Power District Exemption Request LIC-06-056, dated June 9, 2006
Safety Evaluation Report - Exemption for Fort Calhoun Station Independent Spent Fuel

Storage Installation - Docket No. 72-54, dated July 19, 2006
Procedure RE-AD-0005, "Fuel Selection and DSC Planning for Dry Cask Storage", Revision 0
Procedure RE-ST-DFS-0001, "Fuel Selection Verification for Placement in Dry Fuel Storage", Revision 4

Category: Fuel Selection/Verification **Topic:** Fuel Assembly Identification

Reference: CoC 1004, Tech Spec 1.2.1

Requirement Prior to loading of a spent fuel assembly into a canister, the identity of each fuel assembly shall be independently verified and documented.

Finding: This requirement was implemented. The Fort Calhoun spent fuel pool map had been verified approximately 3 months prior to the first loading campaign. Each rack location and spent fuel assembly identification number had been identified and documented. Procedure NMA-3, Step 4.2.4 required that all spent fuel movements between the spent fuel pool racks and the dry fuel storage canister be made using the Fuel Handling Checklist. Prior to grappling each fuel assembly, the fuel handler and spotter independently verified the spent fuel pool rack location matched the Fuel Handling Checklist.

Documents Reviewed: Procedure NMA-3, "Special Nuclear Material Control and Accountability," Revision 13
Form F-2, "Fuel Handling Checklist," Revision 4

Category: Fuel Selection/Verification **Topic:** Loading Plan

Reference: FSAR 1004, Section M.8.1.2.5

Requirement A cask loading plan shall be developed to meet the loading configuration specified in the Fort Calhoun Exemption for Dry Fuel Storage Activities. The loading plan shall be independently verified and approved before the fuel load. A fuel movement schedule shall be written, verified and approved based on the loading plan. All fuel movements from any rack location shall be performed under strict compliance with the fuel movement schedule.

Finding: This requirement was implemented. The Fort Calhoun Exemption for Dry Fuel Storage Activities limited individual fuel assembly decay heat load to 0.500 kW and total canister decay heat load to 11.0 kW.

The 32 fuel assemblies selected for loading into the first canister were identified in Attachment 8.1 of Procedure RE-AD-0005. Each fuel assembly decay heat load was verified to be within the limit for each cell and loading zone, as specified in the exemption. The total heat load for the first canister was calculated and verified to be 9.876 kW.

Procedure NMA-3, Step 4.2.4 required that all spent fuel movements between the spent fuel pool racks and the dry fuel storage canister be made by Operations personnel or designated fuel handlers using Form F-2, "Fuel Handling Checklist." The Fuel Handling Checklist for the canister provided the sequence for moving each fuel assembly, its "from" and "to" locations, and its required orientation in the canister. The checklist was

reviewed and approved by the Principal Reactor Engineer, as documented on Form F-1.

Documents Reviewed: Exemption from 10 CFR 72.48, 10 CFR 72.212 and 72.214 for Dry Fuel Storage Activities - Fort Calhoun (TAC No. L23984) dated July 19, 2006
Safety Evaluation Report - Exemption for Fort Calhoun Station Independent Spent Fuel Storage Installation - Docket No. 72-54, dated July 19, 2006
Procedure RE-AD-0005, "Fuel Selection and DSC Planning For Dry Cask Storage," Revision 0
Procedure NMA-3, "Special Nuclear Material Control and Accountability," Revision 13
Form F-1,"Fuel Handling Checklist Coversheet," Revision 0
Form F-2, "Fuel Handling Checklist," Revision 4

Category: Fuel Selection/Verification **Topic:** Post Loading Verification

Reference: FSAR 1004, Section M.8.1.2.7

Requirement After the canister has been fully loaded, check and record the identity and location of each spent fuel assembly.

Finding: This requirement was implemented. Procedure RE-RR-DFS-0002, Step 7.1.2 required fuel verification to be complete prior to installing the fuel spacers. The post loading verification was performed by two Reactor Engineers using high resolution underwater cameras and video displays. The underwater survey results showed that each spent fuel assembly identification number matched the canister cell location specified in the Fuel Handling Checklist.

Documents Reviewed: Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations", Revision 3
Form F-2, "Fuel Handling Checklist," Revision 4

Category: General License **Topic:** Certificate of Compliance Conditions

Reference: 10 CFR 72.212(b)(2)(i)(A)

Requirement A general licensee shall perform written evaluations, prior to use, that establish that the conditions set forth in the Fort Calhoun Exemption for Dry Fuel Storage Activities have been met.

Finding: This requirement was implemented. Compliance with the general license conditions set forth in the Certificate of Compliance, prior to issue of the Fort Calhoun Exemption for Dry Fuel Storage Activities, was verified during the Programs Inspection on April 10-13, 2006 and documented in Inspection Report 050-00285/06-13; 072-00054/06-02 (ML062000421).

Compliance with the general license conditions that were modified by the Fort Calhoun Exemption for Dry Fuel Storage Activities was verified during this inspection. The exemption conditions were incorporated into the 72.212 Evaluation Report as follows:

Attachment A of the 72.212 Evaluation Report, Technical Specification 1.2.1 bases, documented NRC approval of a maximum canister decay heat load of 11.0 kW and removed the wording concerning transfer cask surface dose rates.

Attachment A of the 72.212 Evaluation Report documented NRC approval of new

transfer cask dose rate limits for Technical Specification 1.2.11. The new limits were 170 mrem/hour three feet above the centerline of the Automated Welding System integral shielding, and 110 mrem/hour on the outside surface of the supplemental shielding sleeve.

Attachment A of the 72.212 Evaluation Report documented NRC approval to start the Technical Specification 1.2.17a vacuum drying clock when the first 750 gallons of water was pumped out of the canister. This ensured the spent fuel assembly cladding temperature did not exceed 752 degrees F and the thermal cycling did not exceed 117 degrees F.

Documents Reviewed: 10 CFR 72.212 Evaluation Report, Revision 0
Exemption from 10 CFR 72.48, 10 CFR 72.212 and 72.214 for Dry Fuel Storage Activities - Fort Calhoun (TAC No. L23984) dated July 19, 2006

Category: Loading Operations **Topic:** Control of Combustible Materials

Reference: FSAR 1004, Section M.4.6.3

Requirement The postulated worst case fire accident is a 300 gallon diesel fuel fire engulfing the transfer cask for 15 minutes at a temperature of 1475 degrees F. Combustible materials in proximity to a loaded transfer cask should be controlled such that a fire involving all of the combustible materials will not exceed the bounding fire conditions.

Finding: This requirement was implemented. Several pallets of combustible radwaste had been temporarily stored on the east end of ISFSI pad at the time of the heavy loads demonstration. These pallets had been removed prior to the first loading campaign.

Two portable light masts and one JLG man lift were introduced to the ISFSI pad during the first HSM loading. Their diesel fuel capacities were added to the existing diesel fuel quantities and the total was verified to be less than 300 gallons.

Documents Reviewed: None.

Category: Loading Operations **Topic:** Spent Fuel Pool Minimum Boron Concentration

Reference: CoC 1004, TS 1.2.1 (Table 1-1g); TS 1.2.15a

Requirement When loading the 32PT canister the canister cavity shall be filled with water borated to the minimum concentration specified in Technical Specification 1.2.1, Table 1-1g. Two samples shall be taken and chemically analyzed by two individuals within 4 hours of loading spent fuel assemblies into the canister and at intervals not to exceed 48 hours while the loaded canister is in the spent fuel pool.

Finding: This requirement was implemented. Procedure RE-RR-DFS-0001, Step 7.4 directed Chemistry to obtain two samples of spent fuel pool water and to analyses them independently for boron concentration. Technical Specification 1.2.1, Table 1-1g required a minimum boron concentration of 2,100 ppm for the first loading campaign.

Technical Specification 1.2.15a required the boron concentration to be verified within 4 hours of fuel loading. Procedure RE-RR-DFS-0001, Step 10.2 required the Loading Supervisor to verify compliance with Technical Specification 1.2.15.a prior to fuel

loading. Two boron samples were taken at 0120 on July 24, 2006 and spent fuel loading commenced at 0505. One sample indicated 2,308 ppm and the other 2,315 ppm.

The loaded canister was removed from the spent fuel pool prior to reaching the 48 hour sampling requirement.

Documents Reviewed: Procedure RE-RR-DFS-0001, "DSC/TC Prep For Fuel Loading Operations", Revision 1

Category: Loading Operations **Topic:** Synthetic Roundsling Inspection

Reference: ASME B30.9, Sect 9-6

Requirement A synthetic roundsling shall be removed from service if any of the following conditions are present: a) missing or illegible sling identification; b) acid or caustic burns; c) evidence of heat damage; d) holes, tears, cuts or snags that expose core yarns; e) broken or damaged core yarns; f) weld splatter that exposes core yarns; g) roundslings that are knotted; h) discoloration and brittle or stiff areas which may mean chemical or ultraviolet/sunlight damage; and i) fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken.

Finding: This requirement was implemented. Section 5.6.3 was added to Standing Order SO-G-61 under Condition Report #200601474 to provide the inspection requirements for synthetic roundslings. The criteria for removing them from service was consistent with ASME Code B30.9. The criteria also included loss of fiber optic integrity and tell-tale visibility, not currently required by the ASME code.

Documents Reviewed: Condition Report #200601474
Standing Order SO-G-61, "Rigging Inspection Program at Fort Calhoun Station", Revision 28

Category: Loading Operations **Topic:** Vacuum Drying Time Clock

Reference: CoC 1004, Tech Spec 1.2.17a Exemption

Requirement The vacuum drying time clock shall start when the initial 750 gallons have been pumped out of the canister. Helium shall be used for canister backfill during canister pump out.

Finding: This requirement was implemented. Procedure RE-RR-DFS-0002, Step 7.1.33 maintained a positive helium overpressure during canister pump out. Step 7.1.35 started the vacuum drying time clock when the initial 750 gallons had been pumped out, as specified in the Fort Calhoun Exemption for Dry Fuel Storage Activities.

Documents Reviewed: Exemption from 10 CFR 72.48, 10 CFR 72.212 and 72.214 for Dry Fuel Storage Activities - Fort Calhoun (TAC No. L23984) dated July 19, 2006
Procedure RE-RR-DFS-0002, "Dry Shielded Canister Sealing Operations", Revision 3

Category: Quality Assurance **Topic:** Procurement Controls

Reference: 10 CFR 72.154(a)/(b)/(c)

Requirement The licensee shall establish measures to ensure that purchased material, equipment, and services conform to procurement documents. These measures must include provisions for source evaluation and selection, objective evidence of quality furnished by the

contractor/subcontractor, inspection at the contractor/subcontractor source and examination of product on delivery.

Finding: This requirement was implemented. Procedure NPD-GL 25.0, Section 25.3.3 required ISFSI project personnel to perform receipt inspections of dry fuel storage components. The receipt inspection checklists for the canisters were reviewed during the team inspection and found to be acceptable. However, the Horizontal Storage Modules (HSMs) had not been accepted by the licensee at that time and the receipt inspection checklists were not available for review. The receipt inspection checklists for the HSMs were reviewed during this inspection.

The inspection checklists were provided in Attachment GL-25-03 of Procedure NPD-GL 25.0. Each HSM consisted of four subassemblies; a base unit, shield door, roof section, and an outlet vent section. Two shield walls, comprised of four sections each, were installed at the east and west end of the ten HSM double array configuration.

Each subassembly was inspected for packaging integrity, shipping damage and proper documentation prior to unloading. Once unloaded, the concrete was inspected for cracks, bugholes, popouts, voids, spalls, and rebar nicks. All ten HSMs were formally accepted by the licensee following receipt inspection.

Documents Reviewed: Procedure NPD-GL 25.0, "Materials Control Management And Receipt At Site Of District Furnished Equipment And Material," Revision 3

Category: Radiation Protection **Topic:** ALARA

Reference: 10 CFR 72.104(b)

Requirement Operational restrictions must be established to meet As Low As Reasonably Achievable (ALARA) objectives for radioactive materials in effluents and direct radiation levels associated with ISFSI operations.

Finding: This requirement was implemented. Due to the expected high dose rates, movements of the loaded transfer cask between the spent fuel pool, decontamination area and transfer trailer were performed remotely using cameras, lasers and laser targets. The cameras provided displays on two screens at the crane remote operating station. The video equipment worked as designed and without failure. Remote operation of the crane was trouble-free.

The areas through which the loaded transfer cask traveled were instrumented with 13 remote reading area monitors. The monitors indicated that a person standing on the work platform would have been exposed to a radiation field of 88 mrem/hour as the transfer cask was removed from the spent fuel pool, increasing to 1,041 mrem/hour as the transfer cask was inserted into the shielding sleeve. A person working near the crane cab would have been exposed to a radiation field of 142 mrem/hour when the transfer cask was at its closest lift point. The first canister contained a total decay heat load of 9.9 kW, rather than the 24 kW decay heat load authorized in the Transnuclear Certificate of Compliance.

Fort Calhoun ISFSI personnel received a collective radiation exposure of 0.515 person-rem during the first cask loading evolution, as estimated from the Electronic

Alarming Dosimeter (EAD) data. Region IV loading campaigns have historically resulted in collective exposures of 0.250 person-rem to 0.970 person-rem per cask. Remote handling of a minimally shielded transfer cask at Fort Calhoun resulted in a collective radiation exposure consistent with other Region IV sites using fully shielded transfer casks and direct handling methods.

Documents Reviewed: Computer Monitoring Station (CMS) printouts dated July 25, 2006

Category: Radiation Protection **Topic:** Horizontal Storage Module Dose Rates

Reference: CoC 1004, Tech Spec 1.2.7.a

Requirement When loaded with a 32PT canister, the Horizontal Storage Module dose rates are limited to 800 mrem/hour on the front surface, 200 mrem/hour on the door centerline and 8 mrem/hour on the end shield wall exterior.

Finding: This requirement was implemented. Following shield door installation, Procedure RE-RR-DFS-0004, Step 7.7.30 required a dose rate survey of the loaded HSM front surface, HSM door centerline and end shield wall exterior. The dose rate limits specified in the procedure were consistent with Technical Specification 1.2.7.a.

The first spent fuel canister was loaded into its Horizontal Storage Module (HSM) on July 29, 2006. Following shield door installation, the HSM dose rates were less than 1 mrem/hour on the front surface, door centerline and end shield wall exterior. A reading of 12 mrem/hour was taken on contact with the inlet air vent.

Documents Reviewed: Procedure RE-RR-DFS-0004, "DSC From TC To HSM Transfer Operations", Revision 2
Survey Log 06-0306, dated July 29, 2006

Category: Radiation Protection **Topic:** Transfer Cask Dose Rates

Reference: CoC 1004, Tech Spec 1.2.11 Exemption

Requirement The Fort Calhoun Exemption for Dry Fuel Storage Activities changed Technical Specification 1.2.11. When containing a loaded 32PT canister, the transfer cask dose rates are limited to 170 mrem/hour axially and 110 mrem/hour radially. The dose rates are measured with the transfer cask inside the shielding sleeve and shielding bell, with the top shield plug, inner top cover plate and Automated Welding System (AWS) integral shield in place. The axial measurement is taken in the centerline of the canister at three feet above the AWS integral shield. The radial measurement is taken on contact with the shielding sleeve.

Finding: This requirement was implemented. Procedure RPI-16, Step 7.17.3 required a dose rate survey of the loaded transfer cask while inside the shielding sleeve and shielding bell, and in the configuration specified in the exemption.

Procedure RPI-16, Step 7.17.3 required gamma and neutron dose rate measurements at three feet from the AWS integral shield. The sum of the gamma and neutron dose rates was limited to 170 mrem/hour. The axial dose rates measured during the first canister loading were 5 mrem/hour total, with 4 mrem/hour gamma and 1 mrem/hour neutron.

Procedure RPI-16, Step 7.17.4 required gamma and neutron dose rate measurements on

contact with the shielding sleeve. The sum of the gamma and neutron dose rates was limited to 110 mrem/hour. The radial dose rates measured during the first canister loading were 5 mrem/hour total, with 2 mrem/hour neutron and 3 mrem/hour gamma. The survey results for both axial and radial dose rate measurements were documented on Survey Form FC-RP-202-194 dated July 25, 2006.

Documents Reviewed: Exemption from 10 CFR 72.48, 10 CFR 72.212 and 72.214 for Dry Fuel Storage Activities - Fort Calhoun (TAC No. L23984) dated July 19, 2006
Omaha Public Power District Exemption Request LIC-06-056, dated June 9, 2006
Safety Evaluation Report - Exemption for Fort Calhoun Station Independent Spent Fuel Storage Installation - Docket No. 72-54, dated July 19, 2006
Procedure RPI-16, "Dry Cask Spent Fuel Storage", Revision 2
Survey Form FC-RP-202-194, Revision 4

Category: Storage Operations **Topic:** HSM Daily Temperature Monitoring

Reference: CoC 1004, Tech Spec 1.3.2

Requirement Evaluate the thermal performance of each HSM on a daily basis. Direct concrete temperatures, direct canister temperatures, air inlet and outlet differential temperatures, or other means may be used to identify off-normal thermal conditions that could lead to exceeding the concrete and fuel clad temperature criteria. If air temperatures are used, they must reflect the thermal performance of the individual module and not the combined performance of adjacent modules.

Finding: This requirement was implemented. Each horizontal storage module was equipped with two thermocouples imbedded in the concrete directly above the stored canister. Procedure OP-ST-SHIFT-0001 recorded both concrete temperature readings on each loaded storage module once per day.

Documents Reviewed: Procedure OP-ST-SHIFT-0001, "Operations Technical Specification Required Shift Surveillance", Revision 96

Category: Storage Operations **Topic:** HSM Startup Thermal Monitoring

Reference: CoC 1004, Tech Spec 1.2.8

Requirement The temperature rise across the HSM shall be recorded at 24 hours following loading and daily thereafter until thermal equilibrium is reached. The maximum temperature rise across an HSM containing a 32PT canister with a decay heat load of 24 kW is 100 degrees F. For an HSM containing a canister with a heat load less than 24 kW, the maximum allowable temperature rise must be calculated. If the maximum temperature rise at equilibrium is within limits, no further startup thermal monitoring is required.

Finding: This requirement was implemented. Procedure RE-RR-DFS-0004, Step 7.8 and Attachment 9 were used to measure and document the temperature rise across each Horizontal Storage Module. Attachment 10 was used to calculate the expected exhaust air temperature for a range of air inlet temperatures. The temperature rise was measured at 24 hours following loading and daily thereafter until thermal equilibrium was reached.

The first HSM was loaded with a canister containing a decay heat load of 9.9 kW. For this decay heat load and the ambient temperatures existing at the time, the expected

HSM temperature rise was calculated to be 32.5 to 34 degrees F. The actual temperature rise at equilibrium was approximately 16.5 degrees F.

Documents Reviewed: Procedure RE-RR-DFS-0004, "DSC From TC To HSM Transfer Operations", Revision 2

Category: Welding **Topic:** Materials - Code Year

Reference: FSAR 1004, Sections M.9.1.2; M.3.1.2.1

Requirement The NUHOMS 32PT canister confinement welds are fabricated in accordance with ASME Code Section III, Subsection NB (1998 edition with 2000 addenda), with exceptions provided under alternate ASME Code Case N-595-2. The top inner cover plate, vent and siphon port covers and the vent and siphon port block define the primary confinement welds at the top end of the 32PT canister.

Finding: This requirement was implemented. The Weldstar Company provided the weld wire spools under Purchase Order #00088364 and the weld wire cut lengths under Purchase Order #00092700. The two Weldstar Certificates of Compliance documented the spool wire and cut lengths met the requirements of ASME Code Section III, Subsection NB 2400, 2001 edition with no addenda.

Documents Reviewed: Weldstar Certificates of Compliance

Category: Welding **Topic:** Materials - Minimum Delta Ferrite Content

Reference: ASME Section III, Article NB-2433; Reg Guide 1.31

Requirement A delta ferrite determination must be made for A-No.8 consumable inserts, bare electrode, rod, or wire filler metal. Exceptions: 1) A-No.8 metal used for weld metal cladding; 2) SFA-5.4 and SFA-5.9 metal; 3) Type 16-8-2 metal. The minimum acceptable delta ferrite content is 5 FN and it must be stated in the certification records.

Finding: This requirement was implemented. The Weldstar Company provided the weld wire spools to OPPD under Purchase Order #00088364. The Weldstar Certificate of Compliance for the spool wire documented a delta ferrite number of 9 FN.

The Weldstar Company provided the weld wire cut lengths to OPPD under Purchase Order #00092700. The Weldstar Certificate of Compliance for the cut lengths documented a delta ferrite number of 8 FN.

Documents Reviewed: Weldstar Certificates of Compliance